Unidade 1: Cálculo algébrico

1. $p:\ \exists x \in \mathbb{R}: (x-1)^2 + |x^2-1| \le 0$

$q:\ \forall x \in \mathbb{R},\ \left|\frac{1}{4}x^2 - 2x + 4\right| > 0$

1.1. $\sim p \Leftrightarrow \sim\left[\exists x \in \mathbb{R}: (x-1)^2 + |x^2-1| \le 0\right] \Leftrightarrow \forall x \in \mathbb{R},\ (x-1)^2 + |x^2-1| > 0$

$\sim q \Leftrightarrow \sim\left[\forall x \in \mathbb{R},\ \left|\frac{1}{4}x^2 - 2x + 4\right| > 0\right] \Leftrightarrow \exists x \in \mathbb{R}: \left|\frac{1}{4}x^2 - 2x + 4\right| \le 0$

1.2. Para $x = 1$, $(x-1)^2 + |x^2-1| = (1-1)^2 + |1^2-1| = 0 + 0 = 0$

Portanto, a proposição $p:\ \exists x \in \mathbb{R}: (x-1)^2 + |x^2-1| \le 0$ é verdadeira pelo que $\sim p$ é **falsa**.

$\frac{1}{4}x^2 - 2x + 4 = 0 \Leftrightarrow x^2 - 8x + 16 = 0 \Leftrightarrow (x-4)^2 = 0 \Leftrightarrow x = 4$

Logo, $\exists x \in \mathbb{R}: \left|\frac{1}{4}x^2 - 2x + 4\right| = 0$ pelo que a proposição $\sim q$ é **verdadeira**.

Como $\sim q$ é verdadeira, a proposição $\sim p \vee \sim q$ também é verdadeira

2.1. $\frac{\left(\frac{1}{2}\right)^{\frac{1}{3}} \times \left(\frac{1}{2}\right)^{\frac{1}{2}}}{2^{\frac{5}{6}}} = \frac{\left(\frac{1}{2}\right)^{\frac{1}{3}+\frac{1}{2}}}{2^{\frac{5}{6}}} = \frac{\left(\frac{1}{2}\right)^{\frac{5}{6}}}{2^{\frac{5}{6}}} = \left(\frac{\frac{1}{2}}{2}\right)^{\frac{5}{6}} = \left(\frac{1}{4}\right)^{\frac{5}{6}} = \left(2^{-2}\right)^{\frac{5}{6}} = 2^{-2 \times \frac{5}{6}} = 2^{-\frac{5}{3}}$

2.2. $\frac{2}{8\sqrt[4]{2^3}} = \frac{2^1}{2^3 \times 2^{\frac{3}{4}}} = \frac{2^1}{2^{3+\frac{3}{4}}} = \frac{2^1}{2^{\frac{15}{4}}} = 2^{1-\frac{15}{4}} = 2^{-\frac{11}{4}}$

2.3. **a)** $\frac{1}{\sqrt[6]{3}} = \frac{\sqrt[6]{3^5}}{\sqrt[6]{3} \times \sqrt[6]{3^5}} = \frac{\sqrt[6]{3^5}}{\sqrt[6]{3 \times 3^5}} = \frac{\sqrt[6]{3^5}}{\sqrt[6]{3^6}} = \frac{\sqrt[6]{3^5}}{3}$

b) $\frac{2}{2\sqrt{3} - \sqrt{2}} = \frac{2\left(2\sqrt{3} + \sqrt{2}\right)}{\left(2\sqrt{3} - \sqrt{2}\right)\left(2\sqrt{3} + \sqrt{2}\right)} = \frac{4\sqrt{3} + 2\sqrt{2}}{4 \times 3 - 2} =$

$= \frac{4\sqrt{3} + 2\sqrt{2}}{10} = \frac{2\sqrt{3} + \sqrt{2}}{5}$

3.1. $\frac{x-2}{x} + \frac{4}{x-2} = \frac{8}{x^2 - 2x} \Leftrightarrow \underset{(x-2)}{\frac{x-2}{x}} + \underset{(x)}{\frac{4}{x-2}} - \frac{8}{x(x-2)} = 0 \Leftrightarrow$

$\Leftrightarrow \frac{(x-2)(x-2) + 4x - 8}{x(x-2)} = 0 \Leftrightarrow \frac{x^2 - 4x + 4 + 4x - 8}{x(x-2)} = 0 \Leftrightarrow$

$\Leftrightarrow x^2 - 4 = 0 \wedge x(x-2) \ne 0 \Leftrightarrow (x = 2 \vee x = -2) \wedge (x \ne 0 \wedge x \ne 2) \Leftrightarrow$

$\Leftrightarrow x = -2$

$S = \{-2\}$

3.2. $3+\frac{1}{9x^2-1}=1+\frac{1}{1-3x} \Leftrightarrow$

$\Leftrightarrow 2+\frac{1}{(3x-1)(3x+1)}+\frac{1}{3x-1}=0 \Leftrightarrow$

$\Leftrightarrow \frac{2(3x-1)(3x+1)+1+3x+1}{(3x-1)(3x+1)}=0 \Leftrightarrow$

$\Leftrightarrow \frac{2(9x^2-1)+2+3x}{(3x-1)(3x+1)}=0 \Leftrightarrow$

$\Leftrightarrow \frac{18x^2-2+2+3x}{(3x-1)(3x+1)}=0 \Leftrightarrow$

$\Leftrightarrow \frac{18x^2+3x}{(3x-1)(3x+1)}=0 \Leftrightarrow$

$\Leftrightarrow 3x(6x+1)=0 \wedge (3x-1)(3x+1)\neq 0 \Leftrightarrow$

$\Leftrightarrow \left(x=0 \vee x=-\frac{1}{6}\right) \wedge \left(x\neq \frac{1}{3} \wedge x\neq -\frac{1}{3}\right) \Leftrightarrow$

$\Leftrightarrow x=0 \vee x=-\frac{1}{6}$

$S=\left\{0\,,-\frac{1}{6}\right\}$

3.3. $\frac{4}{x-1}+\frac{3}{x}=\frac{7}{x+2} \Leftrightarrow \underset{x(x+2)}{\frac{4}{x-1}}+\underset{(x-1)(x+2)}{\frac{3}{x}}-\underset{x(x-1)}{\frac{7}{x+2}}=0 \Leftrightarrow$

$\Leftrightarrow \frac{4x(x+2)+3(x-1)(x+2)-7x(x-1)}{x(x-1)(x+2)}=0 \Leftrightarrow$

$\Leftrightarrow 4x^2+8x+3(x^2+2x-x-2)-7x^2+7x=0 \wedge x(x-1)(x+2)\neq 0 \Leftrightarrow$

$\Leftrightarrow -3x^2+15x+3x^2+3x-6=0 \wedge x\neq 0 \wedge x\neq 1 \wedge x\neq -2 \Leftrightarrow$

$\Leftrightarrow 18x-6=0 \wedge x\neq 0 \wedge x\neq 1 \wedge x\neq -2 \Leftrightarrow$

$\Leftrightarrow x=\frac{6}{18} \wedge x\neq 0 \wedge x\neq 1 \wedge x\neq -2 \Leftrightarrow$

$\Leftrightarrow x=\frac{1}{3}$

$S=\left\{\frac{1}{3}\right\}$

3.4. $\frac{4}{x}-x<0 \Leftrightarrow \frac{4-x^2}{x}<0 \Leftrightarrow$

$\Leftrightarrow x\in\,]-2\,,0[\,\cup\,]2\,,+\infty[$

$S=\,]-2\,,0[\,\cup\,]2\,,+\infty[$

Cálculos auxiliares:

$4-x^2=0 \Leftrightarrow x=-2 \vee x=2$

x	$-\infty$	-2		0		2	$+\infty$
$4-x^2$	$-$	0	$+$	$+$	$+$	0	$-$
x	$-$	$-$	$-$	0	$+$	$+$	$+$
Quociente	$+$	0	$-$	n.d.	$+$	0	$-$

3.5. $\dfrac{2x+1}{3-x}-3<x \Leftrightarrow \dfrac{2x+1}{3-x}-3-x<0 \Leftrightarrow$

$\Leftrightarrow \dfrac{2x+1-9-3x+3x+x^2}{3-x}<0 \Leftrightarrow$

$\Leftrightarrow \dfrac{x^2+2x-8}{3-x}<0 \Leftrightarrow$

$\Leftrightarrow x \in \left]-4\,,\,2\right[\cup \left]3\,,\,+\infty\right[$

$S=\left]-4\,,\,2\right[\cup \left]3\,,\,+\infty\right[$

Cálculos auxiliares:

$x^2+2x-8=0 \Leftrightarrow x=\dfrac{-2\pm\sqrt{4+32}}{2} \Leftrightarrow x=-4 \vee x=2$

$3-x=0 \Leftrightarrow x=3$

x	$-\infty$	-4		2		3	$+\infty$
x^2+2x-8	+	0	−	0	+	+	+
$3-x$	+	+	+	+	+	0	−
Quociente	+	0	−	0	+	n.d.	−

3.6. $\dfrac{2}{2-x} \geq \dfrac{x+3}{2x} \Leftrightarrow \dfrac{2}{2-x}-\dfrac{x+3}{2x} \geq 0 \Leftrightarrow$

$\Leftrightarrow \dfrac{4x-2x-6+x^2+3x}{2x(2-x)} \geq 0$

$\Leftrightarrow \dfrac{x^2+5x-6}{2x(2-x)} \geq 0 \Leftrightarrow$

$\Leftrightarrow x \in \left[-6\,,\,0\right[\cup \left[1\,,\,2\right[$

$S=\left[-6\,,\,0\right[\cup \left[1\,,\,2\right[$

Cálculos auxiliares:

$x^2+5x-6=0 \Leftrightarrow x=\dfrac{-5\pm\sqrt{25+24}}{2} \Leftrightarrow x=-6 \vee x=1$

$2x(2-x)=0 \Leftrightarrow x=0 \vee x=2$

x	$-\infty$	-6		0		1		2	$+\infty$
x^2+5x-6	+	0	−	−	−	0	+	+	+
$2x(2-x)$	−	−	−	0	+	+	+	0	−
Quociente	−	0	+	n.d.	−	0	+	n.d.	−

3.7. $\dfrac{3+x-x^2}{x-1} \leq 1 \Leftrightarrow \dfrac{3+x-x^2}{x-1}-1 \leq 0 \Leftrightarrow$

$\Leftrightarrow \dfrac{3+x-x^2-x+1}{x-1} \leq 0 \Leftrightarrow$

$\Leftrightarrow \dfrac{-x^2+4}{x-1} \leq 0$

$\Leftrightarrow x \in \left[-2\,,\,1\right[\cup \left[2\,,\,+\infty\right[$

$S=\left[-2\,,\,1\right[\cup \left[2\,,\,+\infty\right[$

Cálculos auxiliares:

$-x^2+4=0 \Leftrightarrow x^2=4 \Leftrightarrow x=-2 \vee x=2$

$x-1=0 \Leftrightarrow x=1$

x	$-\infty$	-2		1		2	$+\infty$
$-x^2+4$	−	0	+	+	+	0	−
$x-1$	−	−	−	0	+	+	+
Quociente	+	0	−	n.d.	+	0	−

4.1. $\sqrt{2x-1}=1-\sqrt{x-1} \Rightarrow \left(\sqrt{2x-1}\right)^2=\left(1-\sqrt{x-1}\right)^2 \Rightarrow$

$\Rightarrow 2x-1=1-2\sqrt{x-1}+(x-1) \Leftrightarrow$

$\Leftrightarrow 2\sqrt{x-1}=-x+1 \Rightarrow \left(2\sqrt{x-1}\right)^2=(-x+1)^2 \Rightarrow$

$\Rightarrow 4(x-1)=x^2-2x+1 \Leftrightarrow x^2-6x+5=0 \Leftrightarrow$

$\Leftrightarrow x=\dfrac{6\pm\sqrt{36-20}}{2} \Leftrightarrow x=1 \vee x=5$

Verificação

$x=1$: $\sqrt{2\times1-1}=1-\sqrt{1-1} \Leftrightarrow 1=1$ (verdadeiro)

$x=5$: $\sqrt{2\times5-1}=1-\sqrt{5-1} \Leftrightarrow 3=1-2$ (falso)

$S=\{1\}$

4.2. $\sqrt{x+2}-\sqrt{x+5}+1=0 \Leftrightarrow$

$\Leftrightarrow \sqrt{x+2}+1=\sqrt{x+5} \Rightarrow$

$\Rightarrow x+2+2\sqrt{x+2}+1=x+5 \Leftrightarrow$

$\Leftrightarrow 2\sqrt{x+2}=2 \Leftrightarrow \sqrt{x+2}=1 \Rightarrow$

$\Rightarrow x+2=1 \Leftrightarrow x=-1$

Verificação

$\sqrt{-1+2}-\sqrt{-1+5}+1=0 \Leftrightarrow 1-2+1=0$ (verdadeiro)

$S=\{-1\}$

4.3. $\sqrt[3]{x^2-36}+3=0 \Leftrightarrow \sqrt[3]{x^2-36}=-3 \Leftrightarrow$

$\Leftrightarrow x^2-36=(-3)^3 \Leftrightarrow x^2-36=-27 \Leftrightarrow$

$x^2=9 \Leftrightarrow x=-3 \vee x=3$

$S=\{-3\,,3\}$

4.4. $\sqrt{3x+4}+1=\sqrt{4x+9} \Rightarrow \left(\sqrt{3x+4}+1\right)^2=4x+9 \Rightarrow$

$\Rightarrow 3x+4+2\sqrt{3x+4}+1=4x+9 \Leftrightarrow$

$\Leftrightarrow 2\sqrt{3x+4}=x+4 \Rightarrow$

$\Rightarrow 4(3x+4)=x^2+8x+16 \Leftrightarrow x^2-4x=0 \Leftrightarrow$

$\Leftrightarrow x(x-4)=0 \Leftrightarrow x=0 \vee x=4$

Verificação:

$x=0$: $\sqrt{3\times0+4}+1=\sqrt{4\times0+9} \Leftrightarrow 2+1=3$ (verdadeiro)

$x=4$: $\sqrt{3\times4+4}+1=\sqrt{4\times4+9} \Leftrightarrow 4+1=5$ (verdadeiro)

$S=\{0\,,4\}$

Pág. 12

5.1. $|x-1|=1 \Leftrightarrow x-1=1 \vee x-1=-1 \Leftrightarrow x=2 \vee x=0$

$S=\{0\,,2\}$

5.2. $|x|=|2x-1| \Leftrightarrow x=2x-1 \vee x=-(2x-1) \Leftrightarrow x=1 \vee 3x=1 \Leftrightarrow x=1 \vee x=\frac{1}{3}$

$S=\left\{1,\frac{1}{3}\right\}$

5.3. $2|x-2|=|x-3| \Leftrightarrow |2x-4|=|x-3| \Leftrightarrow 2x-4=x-3 \vee 2x-4=-(x-3) \Leftrightarrow$

$\Leftrightarrow x=1 \vee 3x=7 \Leftrightarrow x=1 \vee x=\frac{7}{3}$

$S=\left\{1,\frac{7}{3}\right\}$

5.4. $|x||x+1| = x \Leftrightarrow |x^2+x| = x \Leftrightarrow \left(x^2+x = x \vee x^2+x=-x\right) \wedge x \geq 0 \Leftrightarrow$

$\Leftrightarrow \left(x^2 = 0 \vee x^2+2x=0\right) \wedge x \geq 0 \Leftrightarrow$

$\Leftrightarrow \left(x = 0 \vee x(x+2)=0\right) \wedge x \geq 0 \Leftrightarrow$

$\Leftrightarrow \left(x = 0 \vee x=0 \vee x=-2\right) \wedge x \geq 0 \Leftrightarrow x=0$

$S = \{0\}$

5.5. $|x-1|^2 = |2x| \Leftrightarrow \left|(x-1)^2\right| = |2x| \Leftrightarrow$

$\Leftrightarrow (x-1)^2 = 2x \vee (x-1)^2 = -2x \Leftrightarrow$

$\Leftrightarrow x^2-2x+1 = 2x \vee x^2-2x+1=-2x \Leftrightarrow$

$\Leftrightarrow x^2-4x+1 = 0 \vee x^2+1=0 \Leftrightarrow$

$\Leftrightarrow x = \dfrac{4 \pm \sqrt{16-4}}{2} \vee x \in \varnothing \Leftrightarrow$

$\Leftrightarrow x = \dfrac{4 \pm \sqrt{12}}{2} \Leftrightarrow x = \dfrac{4 \pm 2\sqrt{3}}{2} \Leftrightarrow$

$\Leftrightarrow x = 2-\sqrt{3} \vee x = 2+\sqrt{3}$

$S = \left\{2-\sqrt{3}\, ,\, 2+\sqrt{3}\right\}$

Pág. 13

6.1. $|x-2| < 5 \Leftrightarrow x-2 > -5 \wedge x-2 < 5 \Leftrightarrow$

$\Leftrightarrow x > -3 \wedge x < 7 \Leftrightarrow x \in \left]-3\, ,\, 7\right[$

$S = \left]-3\, ,\, 7\right[$

6.2. $|2x-1| \geq 4 \Leftrightarrow 2x-1 \leq -4 \vee 2x-1 \geq 4 \Leftrightarrow$

$\Leftrightarrow 2x \leq -3 \vee 2x \geq 5 \Leftrightarrow x \leq -\dfrac{3}{2} \vee x \geq \dfrac{5}{2} \Leftrightarrow$

$\Leftrightarrow x \in \left]-\infty\, ,\, -\dfrac{3}{2}\right] \cup \left[\dfrac{5}{2}\, ,\, +\infty\right[$

$S = \left]-\infty\, ,\, -\dfrac{3}{2}\right] \cup \left[\dfrac{5}{2}\, ,\, +\infty\right[$

6.3. $|x-3| > |2x-1| \Leftrightarrow (x-3)^2 > (2x-1)^2 \Leftrightarrow$

$\Leftrightarrow (x-3)^2 - (2x-1)^2 > 0 \Leftrightarrow$

$\Leftrightarrow \left[(x-3)-(2x-1)\right] \times \left[(x-3)+(2x-1)\right] > 0 \Leftrightarrow$

$\Leftrightarrow (-x-2)(3x-4) > 0 \Leftrightarrow x \in \left]-2\, ,\, \dfrac{4}{3}\right[$

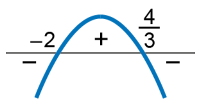
$S = \left]-2\, ,\, \dfrac{4}{3}\right[$

Cálculos auxiliares:

$(-x-2)(3x-4) = 0 \Leftrightarrow$

$\Leftrightarrow -x-2 = 0 \vee 3x-4=0 \Leftrightarrow$

$\Leftrightarrow x=-2 \vee x = \dfrac{4}{3}$



6.4. $|x^2-2x| \leq 1 \Leftrightarrow x^2-2x \geq -1 \wedge x^2-2x \leq 1 \Leftrightarrow$

$\Leftrightarrow x^2-2x+1 \geq 0 \wedge x^2-2x-1 \leq 0 \Leftrightarrow$

$\Leftrightarrow (x-1)^2 \geq 0 \wedge x^2-2x-1 \leq 0 \Leftrightarrow$

$\Leftrightarrow x \in \mathbb{R} \wedge 1-\sqrt{2} < x < 1+\sqrt{2} \leq 0 \Leftrightarrow$

$\Leftrightarrow x \in \left[1-\sqrt{2}, 1+\sqrt{2}\right]$

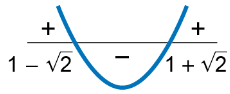
$S = \left[1-\sqrt{2}, 1+\sqrt{2}\right]$

Cálculos auxiliares:

$x^2-2x-1 \leq 0 \Leftrightarrow$

$\Leftrightarrow x = \dfrac{2 \pm \sqrt{4+4}}{2}$

$\Leftrightarrow x = 1-\sqrt{2} \vee x = 1+\sqrt{2}$



7.

7.1. $A(x) = x^5+3x^4+x^3+3x^2$

a)

$$\begin{array}{rrrl|l}
x^5 & +3x^4 & +x^3 & +3x^2 & x^3+2x \\ \hline
-x^5 & & -2x^3 & & x^2+3x-1 \\ \hline
 & 3x^4 & -x^3 & +3x^2 & \\
 & -3x^4 & & -6x^2 & \\ \hline
 & & -x^3 & -3x^2 & \\
 & & +x^3 & \quad +2x & \\ \hline
 & & & -3x^2+2x &
\end{array}$$

Quociente: $Q(x) = x^2+3x-1$

Resto: $R(x) - 3x^2+2x$

b) O resto da divisão de $A(x)$ por $x+3$ é igual a $A(-3)$.

$A(-3) = (-3)^5 + 3\times(-3)^4 + (-3)^3 + 3\times(-3)^2 =$

$= -243+243-27+27 = 0$

c) Se o resto da divisão de $A(x)$ por $(x+3)$ é igual a 0, então $A(x)$ é divisível por $(x+3)$.

	1	3	1	3	0	0
− 3		− 3	0	− 3	0	0
	1	0	1	0	0	0

Quociente: $Q(x) = x^4+x^2$

d) $A(x) > 0 \Leftrightarrow x^5+3x^4+x^3+3x^2 > 0 \Leftrightarrow$

$\Leftrightarrow (x+3)(x^4+x^2) > 0 \Leftrightarrow$

$\Leftrightarrow x^2(x+3)(x^2+1) > 0$

$\Leftrightarrow x \in]-3, 0[\cup]0, +\infty[$

$S =]-3, 0[\cup]0, +\infty[$

Cálculos auxiliares:

x	$-\infty$	− 3		0	$+\infty$
x^2	+	+	+	0	+
$x+3$	−	0	+	+	+
x^2+1	+	+	+	+	+
$x^2(x+3)(x^2+1)$	−	0	+	0	+

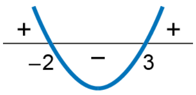
7.2.

a) $x^2 - x - 6 \geq 0 \Leftrightarrow \left]-\infty, -2\right] \cup \left[3, +\infty\right[$

$S = \left]-\infty, -2\right] \cup \left[3, +\infty\right[$

Cálculos auxiliares:

$x^2 - x - 6 = 0 \Leftrightarrow x = \dfrac{1 \pm \sqrt{1+24}}{2} \Leftrightarrow x = -2 \vee x = 3$



b) $x^3 - 6x^2 + 9x \leq 0 \Leftrightarrow x\left(x^2 - 6x + 9\right) \leq 0 \Leftrightarrow$

$\Leftrightarrow x(x-3)^2 \leq 0 \Leftrightarrow$

$\Leftrightarrow x \leq 0 \vee x = 3$

$S = \left]-\infty, 0\right] \cup \{3\}$

$\forall x \in \mathbb{R} \setminus \{3\}, (x-3)^2 > 0$
Se $x = 3$, $x - 3 = 0$.

c) $x^5 - x^4 - 2x^3 > 0 \Leftrightarrow x^3\left(x^2 - x - 2\right) > 0 \Leftrightarrow$

$\Leftrightarrow x \in \left]-1, 0\right[\cup \left]2, +\infty\right[$

$S = \left]-1, 0\right[\cup \left]2, +\infty\right[$

Cálculos auxiliares:

$x^3 = 0 \Leftrightarrow x = 0$

$x^2 - x - 2 = 0 \Leftrightarrow x = \dfrac{1 \pm \sqrt{1+8}}{2} \Leftrightarrow x = -1 \vee x = 2$

	$-\infty$	-1		0		2	$+\infty$
x^3	−	−	−	0	+	+	+
$x^2 - x - 2$	+	0	−	−	−	0	+
$x^5 - x^4 - 2x^3$	−	0	+	0	−	0	+

Pág. 16

8.1. $A(x) = x^3 - 5x^2 + 8x - 4$

Divisores de -4: -4 , 4 , -2 , 2 , -1 e 1

$A(1) = 1^3 - 5 \times 1^2 + 8 \times 1 - 4 = 0$

1 é zero de $A(x)$.

	1	−5	8	−4
1		1	−4	4
	1	−4	4	0

$A(x) = (x-1)\left(x^2 - 4x + 4\right) = (x-1)(x-2)^2$

8.2. $B(x) = x^3 - 3x^2 + 2x - 6$

Divisores de –6: $-6, 6, -3, 3, -2, 2, -1$ e 1

$B(1) = 1^3 - 3\times 1^2 + 2\times 1 - 6 = -6$

$B(2) = 2^3 - 3\times 2^2 + 2\times 2 - 6 = -6$

$B(3) = 3^3 - 3\times 3^2 + 2\times 3 - 6 = 0$

3 é zero de $B(x)$

	1	–3	2	–6
3		3	0	6
	1	0	2	0

$B(x) = (x-3)(x^2+2)$

9.1. $x^4 - 4x^2 - 5 = 0 \Leftrightarrow (x^2)^2 - 4x^2 - 5 = 0 \Leftrightarrow$

$\Leftrightarrow x^2 = \dfrac{4 \pm \sqrt{16+20}}{2} \Leftrightarrow x^2 = \dfrac{4\pm 6}{2} \Leftrightarrow$

$\Leftrightarrow x^2 = 5 \vee x^2 = -1 \Leftrightarrow$

$\Leftrightarrow x = \sqrt{5} \vee x = -\sqrt{5}$

$S = \{\sqrt{5}, -\sqrt{5}\}$

9.2. $x^9 + x^5 - 2x = 0 \Leftrightarrow x(x^8 + x^4 - 2) = 0 \Leftrightarrow$

$\Leftrightarrow x = 0 \vee (x^4)^2 + x^4 - 2 = 0 \Leftrightarrow$

$\Leftrightarrow x = 0 \vee x^4 = \dfrac{-1 \pm \sqrt{1+8}}{2} \Leftrightarrow$

$\Leftrightarrow x = 0 \vee x^4 = \dfrac{-1\pm 3}{2} \Leftrightarrow$

$\Leftrightarrow x = 0 \vee x^4 = 1 \vee x^4 = -2 \Leftrightarrow$

$\Leftrightarrow x = 0 \vee x = 1 \vee x = -1 \vee x \in \varnothing$

$S = \{-1, 0, 1\}$